DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/06/2009 has been entered.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2.   Claims 10 and 13-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. As to claim 10, Applicant on lines 8-9, states "a filter configured to divide the digitized received signal into a plurality of frequency sub-bands" and then states "an analog-to-digital converter configured to digitize the signal in each sub-band". The second limitation implies that the output of the filter is in analog form, however the first limitation recites that the filter performs filtering on the digitized signal. Therefore the second limitation contradicts the first limitation and renders the claim vague.

Claims 13-19 depend in claim 10; therefore they are rejected as well.

3.   Claims 12, 4-9, and 11 are rejected under 35 U.S.C. 112, second paragraph, as

being indefinite for failing to particularly point out and distinctly claim the subject matter

which applicant regards as the invention. As to claim 12, Applicant on lines 6-7, states

"a filter configured to divide the digitized received signal into a plurality of frequency

sub-bands" and then states "an analog-to-digital converter configured to digitize the

signal in each sub-band". The second limitation implies that the output of the filter is in

analog form, however the first limitation recites that the filter performs filtering on the

digitized signal. Therefore the second limitation contradicts the first limitation and

renders the claim vague.

Claims 4-9 and 11 depend in claim 12; therefore they are rejected as well.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 10, 13, 16, 17, and 19 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Kober et al. (hereafter, referred as Kober) (US 2001/0000660), in

view of Liberti, Jr. et al. (hereafter, referred as Liberti) (US 5,550,872).

As to claim 10, Kober discloses a signal receiver comprising (see Figs. 14 and

15): a processor (see Fig. 14, blocks 212, 216, 228; Fig. 15, blocks 376 and 384; and

paragraph 0104) configured to extract information content of a digitized received

signal, wherein the processor multiplies the reconstructed received signal by a

reference signal (see paragraphs 0104 and 0119) in the frequency domain (see

paragraph (see paragraph 0047); and a digitizer configured to digitize the received

signal, wherein the digitizer comprises: a filter (see Fig. 14, block 220) configured to

divide the digitized received signal into a plurality of frequency sub-bands (see

paragraph 0049); an analog-to-digital converter configured to digitize the signal in each

sub-band (see paragraph 0013); and a re-constructor (see Fig. 14, block 244 and

paragraph 0014) configured to concatenate in the frequency domain the digitized

received signal in each sub-band thereby reconstructing the spectrum of the digitized

received signal, wherein the re-constructor reconstructs the spectrum of the digitized

received signal at a frequency lower than the frequency of the spectrum of the digitized

received signal prior to being divided into sub-bands (i.e. because of having low-pass

filters in analysis and synthesis filters; in see paragraph 0048). Kober discloses all the

subject matters claimed in claim 10, except that the transformers transform the

digitized signal in each sub-band into the frequency domain. Furthermore, Kober does

not disclose that the outputs of the FFTs (transformers) have non-uniformly spaced

frequencies. As to the first limitation, Liberti discloses a radio signal receiver (see Fig.

2, blocks 108, 214, 220, 218, and 222) comprising a plurality of A/D converters (220)

and parallel branch DSPs 218. Liberti further discloses that each branch DSP

comprises a Fourier Transform element (see Fig. 3, block 314), wherein the FFTs

convert the output of each A/D (i.e. each sub-channel) into frequency domain (see

column 6, lines 8-12). As to the second limitation, since Liberti does not disclose that

the FFTs are exactly identical, therefore inherently the frequency components of the reconstructed spectrum are not uniformly spaced. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Kober as suggested by Liberti and perform frequency domain transformation prior to recovering the transmitted signal to reduce the complexity of the system (see column 2, first paragraph).

As to claim 13, Kober does not disclose that the analog-to-digital converters sample the sub-bands at different rates, therefore Kober teaches using the same rate for all the converters (see paragraph 0013).

As to claim 16, Kober in Fig. 15 shows an analog to digital converter (see block 316) that sequentially digitizes the baseband (wideband) signal. Kober does not disclose that ADC can be placed after the sub-band filters, however, the location of ADC in the circuit is a matter of design choice and it would have been obvious to one of ordinary skill in the art at the time of invention to place the ADC after the sub-band filters to meet the design requirements of the system.

As to claim 17, Kober and Liberti disclose all the subject matters claimed in claim 16, except that the transformer transforms the digitized signal in a plurality of the sub-bands sequentially. However, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Liberti and instead of using a plurality of FFTs use only one and therefore transform the sub-bands sequentially to reduce the size and cost of the system.

As to claim 19, Kober discloses a down-converter (see Fig. 12, blocks 172) for down-converting the received signal from a transmission frequency to a lower frequency prior to the digitization by the digitizer of the received signal.

5.   Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kober and Liberti, in view of Kolanek (US 2002/0027958).

As to claim 14, Kober and Liberti disclose all the subject matters claimed in claim 10, except that the analog-to-digital converter samples the received signal in a first subset of the sub-bands at a first sample rate, and wherein the received signal in adjacent sub-band is sampled at unequal sample rates. Kolanek, in the same field of endeavor, discloses dividing a wideband RF signal into a number of smaller sub-bands (see the abstract and paragraph 0016). Kolanek further discloses that each sub-band is in turn translated to an intermediate frequency band or baseband, and then digitized according to a sampling rate that need only be sufficiently high to capture the bandwidth of that sub-band (see the abstract and paragraph 0016). Therefore according to Kolanek each sub-band has its own sampling rate. Kolanek does not expressly disclose that adjacent sub-bands have different sampling rates. However, based on Kolanek's teaching, each sub-band has its own sampling rate that may or may not be equal to the other adjacent sub-bands. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Kober and Liberti as suggested by Kolanek to accurately sample each sub-band and increase the performance of the system.

As to claim 15, Kober and Liberti disclose all the subject matters claimed in claim 13, except that the plurality of sub-bands having a common sample rate, have a

common bandwidth. Kolanek, in the same field of endeavor, discloses dividing a

wideband RF signal into a number of smaller sub-bands (see the abstract and

paragraph 0016). Kolanek further discloses that each sub-band is in turn translated to

an intermediate frequency band or baseband, and then digitized according to a

sampling rate that need only be sufficiently high to capture the bandwidth of that sub-

band (see the abstract and paragraph 0016). Therefore according to Kolanek each sub-

band might have its own sampling rate determined based on its bandwidth. It would

have been obvious to one of ordinary skill in the art at the time of invention to modify

Kober and Liberti as suggested by Kolanek to accurately sample each sub-band and

increase the performance of the system.

6.   Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kober

and Liberti, in view of Liu et al. (hereafter, referred as Liu) (US 6,442,195).

        As to claim 18, Kober and Liberti disclose all the subject matters claimed in claim

10, except that the re-constructor selects a replica spectrum of a sub-band signal and a

re-inverter for re-inverting the replica spectrum if the replica spectrum is inverted. Liu,

in the same field of endeavor, discloses a communication system comprising: a

processor (see block 260) configured to extract information content of a digitized

received signal (i.e. the output of block 295) (see claim 70), a digitizer (see block 295)

configured to digitize a received signal and wherein the digitizer comprises: a filter

configured to divide (see blocks 280A-C) the received signal into a plurality of

frequency sub-bands (see column 6, last paragraph, column 7, last paragraph-column

8, second paragraph), an analog-to-digital converter (see the ADCs) configured to

digitize the signal in each sub-band, a transformer configured to transform the digitized

received signal into the frequency domain (see Fig. 1E, block 84, column 10, lines 6-

10, and column 12, last line), and a re-constructor (see Fig. 1E, the output of FFT; Fig.

2, blocks 270 and 260; the abstract; and column 6, last paragraph) configured to

concatenate (see buffer 270) in the frequency domain the digitized received signal in

each sub-band thereby reconstructing the spectrum of the received signal. Liu further

discloses that re-constructor selects a replica spectrum of a sub-band signal (e.g. each

individual output of ADC) and a re-inverter (i.e. a shifter) for re-inverting (or shifting) the

replica spectrum if the replica spectrum is inverted (displaced from its original position)

(see column 8, lines 15-20). It would have been obvious to one of ordinary skill in the

art at the time of invention to modify Kober and Liberti as disclosed by Liu to

reconstruct the transmitted signal more accurately.

Allowable Subject Matter

7.   Claims 12, 4-9, and 11 would be allowable if rewritten in a way to overcome the

35 U.S.C. 112, second paragraph rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Leila Malek whose telephone number is 571-272-8731.

The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

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Leila Malek
Examiner
Art Unit 2611

/L.M./
/Leila Malek/
Examiner, Art Unit 2611

/Mohammad H Ghayour/
Supervisory Patent Examiner, Art Unit 2611